5. $y = x\sqrt{8-x^2}$ extrema $-\sqrt{8} \le x \le \sqrt{8}$

$y' = x\,\frac{1}{2}(8-x^2)^{-\frac{1}{2}}(-2x) + \sqrt{8-x^2}\cdot 1$

$0 = \left(\frac{-x^2}{\sqrt{8-x^2}} + \sqrt{8-x^2}\right)\sqrt{8-x^2}$

$0 = -x^2 + 8 - x^2$

$f' = *$

$f' = 0 \quad 0 = 8 - 2x^2 \quad x^2 = 4 \quad x = \pm 2$

$8 - x^2 = 0 \quad x^2 = 8 \quad x = \pm\sqrt{8} \quad x = \pm 2\sqrt{2}$

C.P. $f' = 0$, $f' = *$

$* \; - \; 0 \; + \; + \; + \; 0 \; - \; *$

$-2\sqrt{2} \quad -2 \quad 2 \quad 2\sqrt{2}$

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33. $y = 3x - x^3 + 5$ extrema

2nd der test:

$y' = 3 - 3x^2 = 0$

$x = \pm 1$

$y'' = -6x$

at $x = 1$, $y'' = -6 < 0$

at $x = -1$, $y'' = 6 > 0$

$f'(c) = 0$

$f''(c) > 0$ ⌣ min at $x = c$

$f'(c) = 0$ ✓

$f''(c) < 0$ ✓ ⌢ max at $x = c$

max at $x = 1$

min at $x = -1$

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4.4 optimization

strategy p 219

1. understand the problem (question)
   what is given? what should you find?
   what do you need?
2. find the equation: pictures, diagrams
   variables, constants, try: "what if"
   what if x=6
3. graph, domain (x's) specific values
   restrict to fit real world.
4. critical pts, end pts
5. 1st der test or 2nd der test
   sign graph, sentence
6. plug in, find y's, answer the question
   make sense?

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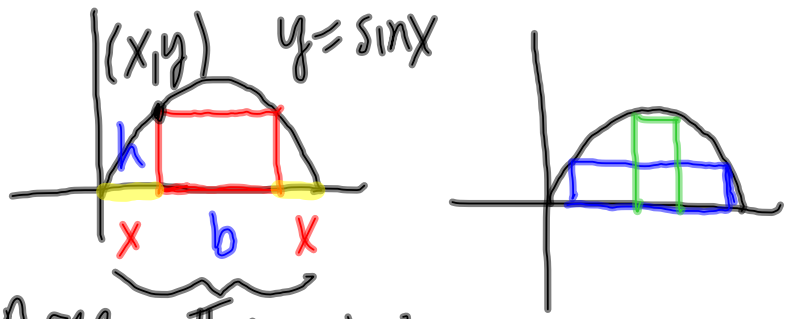
Ex 2
p 219



max Area

$A = b \cdot h$

$h = y = \sin x$

$h = \sin x$

$x + b + x = \pi$

$b = \pi - 2x$

$A = \sin x \cdot (\pi - 2x)$

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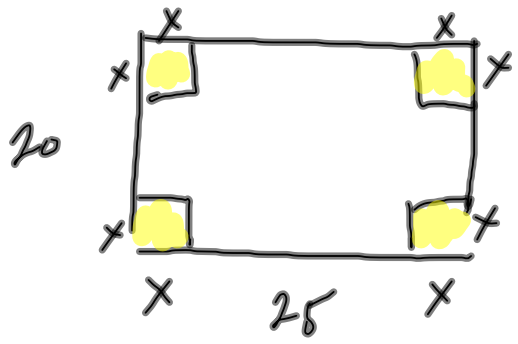
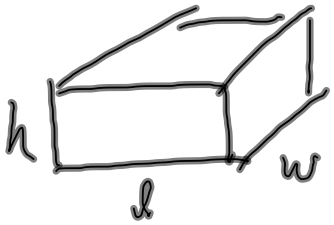
Ex 3





$h = x$

$l = 25 - 2x$

$w = 20 - 2x$

max vol $V = l \cdot w \cdot h$

$V = x(25 - 2x)(20 - 2x)$

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